

Cellular and Molecular Biology, Block 1 Weekly Formative Questions
Week 2 (August 27 – August 31, 2012)

Dr. Dignam HB and Enzymes

1. The effector 2,3 bisphosphoglycerate binds to hemoglobin
 - A. at the same site as oxygen.
 - B. at the same site as carbon dioxide.
 - C. and increases affinity for oxygen compared to hemoglobin lacking this effector.
 - D. in a cavity between the beta subunits through positively charged side chains.
 - E. and decreases protonation of histidine 146.

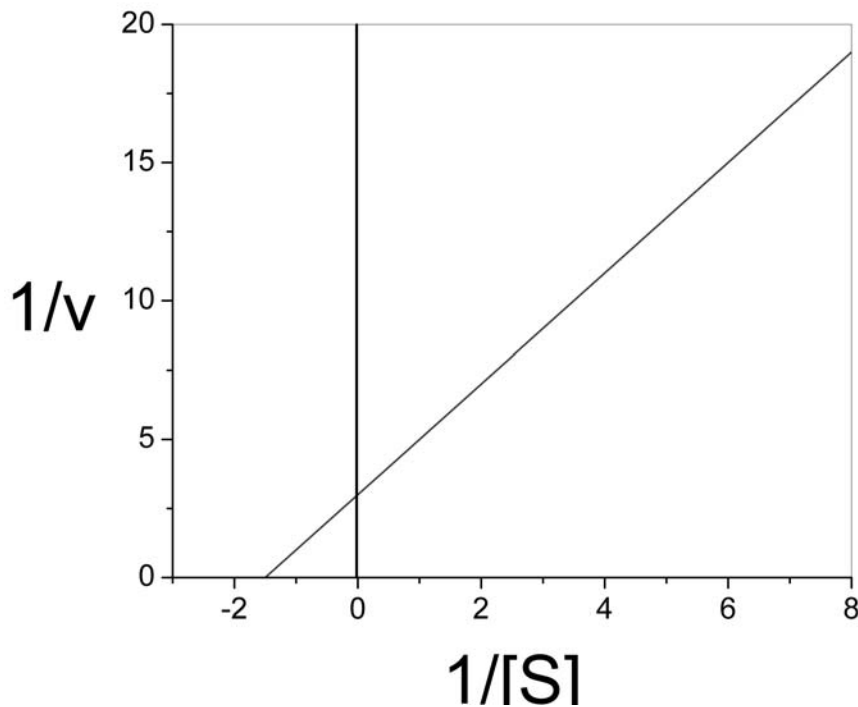
2. A 55 year old, white male construction worker is brought to the emergency room by his wife complaining of a pain radiating to his left arm and profuse sweating. Laboratory findings indicate elevated creatine phosphokinase, troponin, and myoglobin. The laboratory findings are best explained by
 - A. activation of existing creatine kinase in the blood and release of troponin and myoglobin from liver.
 - B. activation of existing creatine phosphokinase in the blood and release of troponin and myoglobin from muscle.
 - C. release of creatine phosphokinase, troponin and myoglobin from liver cells.
 - D. release of creatine phosphokinase, troponin and myoglobin from muscle fibers.
 - E. release of creatine phosphokinase, troponin and myoglobin from cardiac cells.

3. Which of the following best describes the oxygen binding to hemoglobin?
 - A. Four equivalent binding sites
 - B. A single class of binding sites
 - C. Negatively cooperative binding
 - D. Positively cooperative binding
 - E. Hyperbolic binding

4. Enzymes can promote catalysis by
 - A. hydrophobic interactions between residues in the ligand binding site and a substrate.
 - B. by providing proper orientation of enzyme and substrate reactive groups.
 - C. by forming a covalent bond with the substrate.
 - D. by donating to or accepting a proton from the substrate.
 - E. all of the above.

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5. Synthetases (ligases) catalyze
- A. group transfer.
 - B. hydrolysis of peptide bonds.
 - C. joining of two reactants in a reaction requiring energy derived from ATP.
 - D. nonoxidative, nonhydrolytic cleavage of C-C or C-N bonds.
 - E. oxidation/reduction reactions
6. In the plot shown below what kinetic constant can be determined from the value on the y intercept?



- A. V_{\max}
- B. K_m
- C. V_{\max}/K_m
- D. k_{cat}
- E. the Hill coefficient (n)

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Dr. Manning TCA Cycle

7. The enzyme that catalyzes an anaplerotic reaction in the citric acid cycle is
- A. succinate dehydrogenase.
 - B. aconitase.
 - C. citrate synthase.
 - D. pyruvate dehydrogenase (PDH).
 - E. pyruvate carboxylase
8. Which coenzyme is NOT required in the pyruvate dehydrogenase and α -ketoglutarate dehydrogenase reactions?
- A. Biotin
 - B. Lipoic acid
 - C. Thiamine pyrophosphate
 - D. FAD
 - E. NAD^+
9. The substrates for the two enzymatic reactions in the citric acid cycle in which CO_2 is liberated are
- A. citrate and α -ketoglutarate.
 - B. isocitrate and α -ketoglutarate.
 - C. cis-aconitate and α -ketoglutarate.
 - D. citrate and isocitrate.
 - E. isocitrate and oxaloacetate.

Dr. Manning Electron Transport & Oxidative Phosphorylation

10. The chemiosmotic coupling hypothesis of oxidative phosphorylation proposes that adenosine triphosphate is formed because
- A. of a change in the permeability of the inner mitochondrial membrane toward adenosine diphosphate (ADP).
 - B. of the formation of high-energy bonds in mitochondrial proteins.
 - C. ADP is pumped out of the matrix into the intermembrane space.
 - D. a proton gradient forms across the inner membrane.
 - E. protons are pumped into the mitochondrial matrix.

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11. Which of the following statements is CORRECT?
- A. Cytochrome c can carry two electrons at a time during electron transport.
 - B. Dinitrophenol uncouples oxidative phosphorylation by dissipating the proton gradient across the inner mitochondrial membrane.
 - C. Cyanide reacts with cytochrome c.
 - D. Rotenone specifically inhibits cytochrome oxidase.
 - E. Heme A in cytochrome oxidase is identical with the heme group of hemoglobin.
12. Some of the free energy released in the mitochondrial electron transport chain can be harnessed to form adenosine triphosphate (ATP). How many moles of ATP can be formed per pair of electrons transferred from reduced nicotinamide-adenine dinucleotide (**NADH**) to oxygen?
- A. 0
 - B. 1.5
 - C. 2.5
 - D. 3.0
 - E. 4.0

Dr. Crissman - Connective Tissues

13. Select the **CORRECT** statement about collagen formation.
- A. Type I collagen is produced by fibrocytes and osteocytes.
 - B. The lack of hydroxylation of proline during collagen formation leads to the disease called rickets.
 - C. The aggregation of tropocollagen molecules occurs inside of the cell.
 - D. At one level, the collagen type I fiber is held together by the covalent bonding of hydroxyproline.
 - E. The alpha chains are formed from amino acids of which desmosine is the most common.

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14. Select the **CORRECT** statement.
- A. Interstitial fluid does not circulate through the extracellular space.
 - B. The amount of glycoproteins present in the extracellular space is key in the formation of interstitial fluid.
 - C. Blockage of the lymphatic vessels reduces edema.
 - D. Excess basement membrane in the extracellular space is a common cause of edema.
 - E. Edema is caused by excess water in the extracellular space.
15. The basement membrane
- A. surrounds all "fixed" cells.
 - B. sequesters large amounts of histamine which is released during anaphylaxis.
 - C. may act as a macromolecular sieve.
 - D. contains predominately type IX collagen in the lamina lucida.
 - E. contains large amounts of aggrecan in the lamina densa

Dr. Crissman Cell Motility

16. Select the **CORRECT** statement.
- A. Leukocyte adhesion deficiency results in the inability of leukocytes to enter the extracellular space at infection sites.
 - B. Integrin is not involved in blood clotting.
 - C. The glycoprotein, aggrecan, promotes migration of mesenchymal cells during development.
 - D. Actin and myosin in motile cells is responsible for the swimming motion of the pseudopodia, which propels the cell through the ground substance of the extracellular matrix.
 - E. Integrin is the initial molecule that is responsible for directing a leukocyte where to leave the vessel during extravasation.

(See next page for answers)

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| Instructor | Question | Answer |
|-------------------|-----------------|---------------|
| Dr. Dignam | 1 | D |
| | 2 | E |
| | 3 | D |
| | 4 | E |
| | 5 | C |
| | 6 | A |
| Dr. Manning | 7 | E |
| | 8 | A |
| | 9 | B |
| | 10 | D |
| | 11 | B |
| | 12 | C |
| Dr. Crissman | 13 | A |
| | 14 | E |
| | 15 | C |
| | 16 | A |